

PRESSURE RANGES VS. TRAINING

Pressure Ranges:

Low

- 0-150 psig. (gas)
- 0-1,500 psig. (liquid)

Intermediate

- 150-3,000 psig. (gas)
- 1,500-5,000 psig. (liquid)

High

- 3,000-100,000 psig. (gas)
- 5,000-120,000 psig. (liquid)

Design/Documentation

- Pressure Seminar for Engineers

Training:

H.S. 5030

H.S. 5040

H.S. 5050

H.S. 5060

HS-5030-5

DEFINITIONS:

M.A.W.P.

Maximum allowable working pressure.

Relief Device setting (ASME Code).

M.O.P.

Maximum operating pressure.

10 to 20% below M.A.W.P.

SAFETY FACTOR

$$\text{Safety Factor (S.F.)} = \frac{\text{Failure Pressure}}{\text{M.A.W.P.}}$$

Manned Area - 4 Remote Area - less than 4
3 or less requires upper management approval.

HS-5030-6

Five Elements of a Pressure Safety Program

1. A Pressure Safety Manual

- *which outlines the policies, procedures and requirements for pressure vessels and systems to be designed, procured and/or operated by any Lab employee or contractor at the facility.*

2. A Safety Committee

- *to set and review safety policies, address unusual problems and occurrences, and provide advice and assistance with pressure safety.*

3. Personnel who are trained and qualified

- *through formal classroom attendance, testing, and on-the-job experience to design, build and/or operate pressure systems in a safe manner.*

4. Documentation and Accountability

- *for each pressure vessel or system describing the design, pressure rating, traceability, testing, operation, and maintenance requirements when applicable.*

5. Control of the selection and use of high pressure hardware

- *including quality control requirements for vendors, procurement to applicable specifications, and the issuance and assembly of high pressure components by certified installers.*

HS-5030-7

PROGRAM CONCEPT

**All pressure systems must be
designed, tested, inspected,
and used
in accordance with
sound engineering principles
by qualified and trained personnel.**

HS-5030-8

Engineering Safety Note

"A management-approved design document attesting every practicable precaution has been taken in the design of equipment to control all significant hazards"

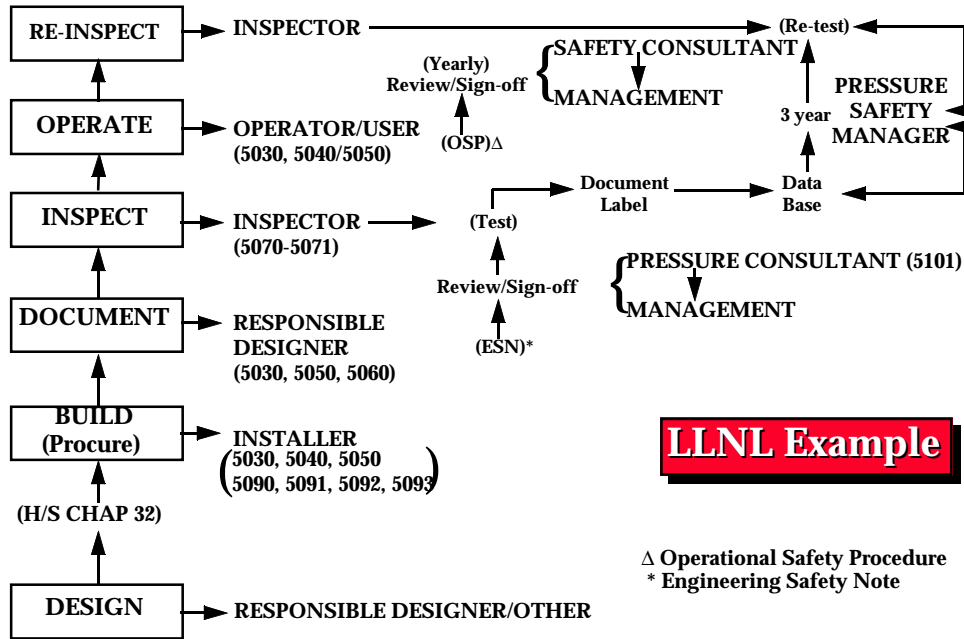
---certifies mechanical integrity---

Operational Safety Procedure

An OSP assigns responsibility for safe operations, describes the work to be done, identifies the hazards and environmental concerns, and should describe maintenance and quality assurance of safety-related systems and equipment.

HS-5030-9

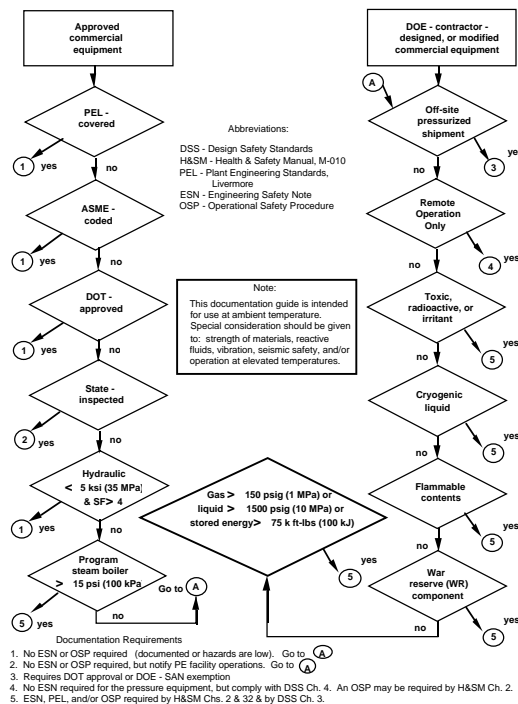
LLNL Pressure Safety Program



HS-5030-11

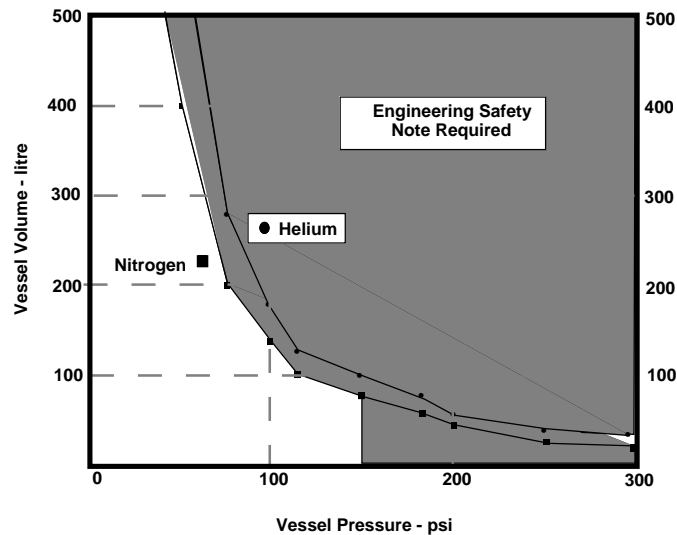
LLNL Documentation Guide for Pressure Equipment (Element 1)

LLNL Example



HS-5030-12

Engineering Safety Note Requirements for a Vessel or System Containing 100 Kjoules of Stored Energy



HS-5030-13

The Mechanical Engineering Safety Committee *(Element 2)*

- Made up of representatives from each Engineering Division.
- Department management.
- Pressure Safety Manager (also represents Hazards Control Department).
- Provides Design Safety guidance to the LLNL Pressure Safety Program.
- Reviews and sets policy on special pressure safety issues not covered in standard policy and procedures.

LLNL Example

HS-5030-14

Authorized Individuals for Pressure Work at LLNL (*Element 3*)

(Latest Revision)

LLNL Example


HS-5030-15

Labeling (*Element 4*)

Typical In-House Label

LLNL PRESSURE TESTED FOR MANNED AREA	
ASSY.	
SAFETY NOTE	
M.A.W.P.	PSIG.
FLUID	
TEMP.	TO °F
REMARKS	
TEST NO.	T.R.
EXPIRATION DATE	
BY	DATE

ASME Code Stamp

	Certified by
	(Name of Manufacturer)
	psi at °F
	(Max. allowable working pressure)
W (if arc or gas welded)	(Manufacturer's serial number)
RT (if radio-graphed)	
HT (if postweld heat treated)	(Year built)

LLNL Example

HS-5030-16

Obtaining Pressure Components *(Element 5)*

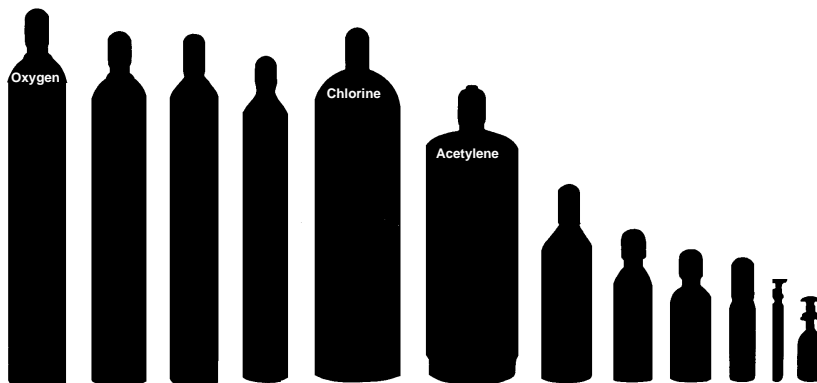
- **Low/Intermediate Pressure Hardware**
 - Routine Stores issue.
 - Regulators, safety manifolds and relief devices obtained through B-511 Instrument Shop, ext. 2-9762, or B-343 High Pressure Laboratory, ext. 2-9596.
- **High Pressure Hardware**
 - Only to “Authorized Individuals for Pressure Work” list.
- **Single Point Issue (High Pressure Laboratory)**
 - For high pressure hardware issue and ordering.
 - B-343, ext. 3-2750 (Certification Coordinator).
- **Salvage Hardware**
 - Use only after “Pressure Inspector” approval.

LLNL Example

HS-5030-17

Compressed Gas Cylinders

Handling, Storage, Use



HS-5030-18

We will discuss . . .

- **Cylinder Facts**
- **Cylinder Identification**
 - Color codes
 - Labeling
 - Status tags
- **Proper Handling/Storage/Use**
- **Cylinder Valves and Reliefs**
- **Important Features**
- **Special Commercial Cylinders**
- **Sample Cylinders**

HS-5030-19

Cylinder Facts

- **Design and use is per Department of Transportation (DOT) specifications.**
 - For example DOT 3AA-2265.
- **Standard 2 ksi+ cylinder has $1\frac{1}{2}$ cubic feet of water volume—about 200 standard cubic feet of gas.**
- **Standard cylinder is 9” O.D., but various heights.**
- **Maximum recommended temperature = 125°F**

HS-5030-20

Proper Identification

- **Color Codes**
- **DOT Shoulder Labels**
- **Product Labels**
- **Status Tags**

HS-5030-21

Cylinder Content

- **Cylinder color is not reliable**
- **Shoulder label now required. Contains information on:**
 - Chemical content
 - Health Hazards
 - Reactivity (i.e., Oxidizer, flammable, non-flammable)

HS-5030-22

Handle Gas Cylinders Properly

- **NEVER** move or transport without cylinder cap installed
- **ALWAYS** use proper lifting fixtures
- Use gas cylinder cart for any in-house moves-- not your back!

HS-5030-23

Store Cylinders Properly

- Store out of direct sunlight when possible
- Separate full bottles from empty bottles
- **Separate oxidizers from flammables**
- Provide clear warning signs for toxic/corrosive
- Store horizontal cylinders carefully

HS-5030-24

Use Gas Cylinders Properly

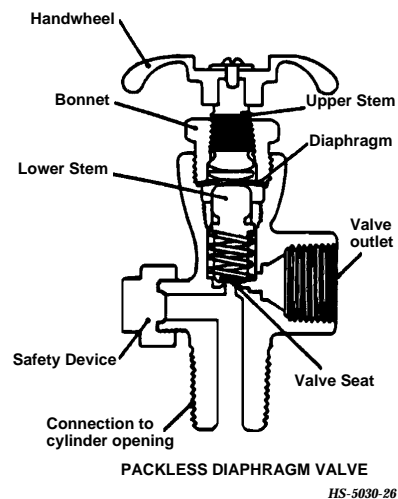
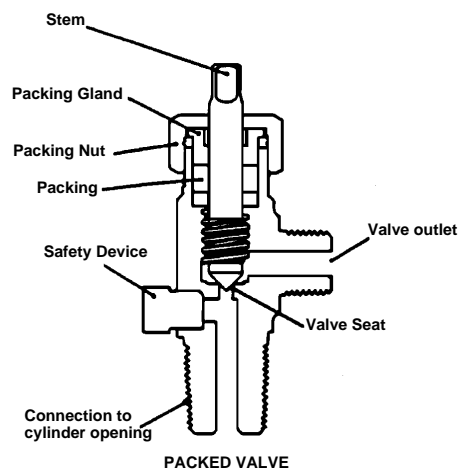
- **ALWAYS** secure before using
- Use storage racks whenever possible
- Leave some residual gas in cylinder
 - Typically +/- 50 psi
- **ONLY** vendors can refill vendor-owned cylinders

HS-5030-25

Types of Cylinder Valves

(refer to CGA-Appendix B)

These valves and their subcomponents come in various materials to resist the corrosive properties of various gases.



HS-5030-26

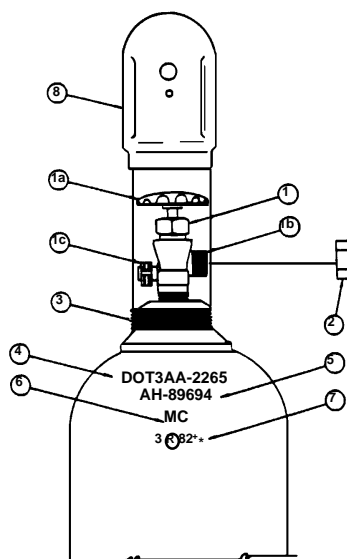
Cylinder Relief Devices

<u>Type</u>	<u>Use</u>
Spring loaded	propane, mapp gas
Frangible disc	CO ₂ , N ₂ , O ₂ , argon, He
Fusible plug	acetylene, chlorine
Frangible disc backed by fusible metal	hydrogen, methane
No relief device	arsine, fluorine, phosgene

HS-5030-27

Important Features Common to Gas Cylinders

1. Valve: (a) handwheel, (b) CGA outlet connection, (c) pressure relief device
2. Valve outlet cap
3. Cylinder collar
4. DOT specification (3AA) and service pressure (2,265 psig)
5. Serial number
6. Manufacturer's symbol
7. Test date (3/82), original tester's symbol (MC), hydrostatic retesting extension allowance (*), and permission to overpressure by 10%+
8. Cylinder cap



HS-5030-28

Other Commercial Cylinders

- **Lecture bottle**
 - Typically 15”L x 2”Ø, 500 cc
 - For samples or specialty gases
 - DOT Spec. 3E-1800
 - Non-returnable, hence no retest required
- **6 ksi cylinder**
 - 10”Ø x 1.5 ft³ water volume
 - twice as heavy as 2 ksi+ cylinders
 - DOT Spec. 3AA-6000
 - 6 ksi commercially available for argon, helium, nitrogen only

HS-5030-29

Sample Cylinders



HS-5030-30

ACCIDENT CASE HISTORIES

Accident Severity

**Accident severity is not necessarily a
function of pressure . . .**

rather it is related to energy and force.

HS-5030-33

Low Pressure/High Energy Accidents

**Low pressure/high energy accidents are more
likely to occur because there is a lack of intuitive
hazard appreciation.**

- **Failure to consider hazards**
- **Failure to recognize hazards**
- **Failure to follow safe practice**

HS-5030-34

Causes of Accidents

Engineering

- **Poor Design**
 - Control and Safety Devices
 - Material Strength
 - Material Compatibility
- **Faulty Component Manufacture**

Technician/User

- **Faulty Assembly/Installation**
- **Poor Maintenance**
- **Poor Operating Practices**
 - Failure to Adhere to Procedures
 - Wrong Materials
 - Misuse

HS-5030-35

Safety Manifold - the bridge between source gas and end use

Functions of this bridge are:

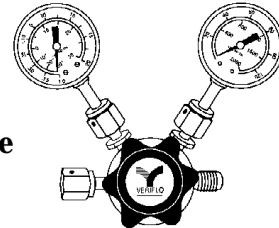
- **Regulate delivery pressure . . . (Pressure Regulator)**
- **Protect from overpressure . . . (Relief Device)**
- **Indicate value of pressure . . . (Pressure Gauge)**
- **Vent unused excess gas**
- **Throttle (meter) gas into its end use**

HS-5030-36

Regulators (reduce pressure)*

Single stage regulators

- Precise pressure regulation is not important
- High flow rates are needed
- Use above 200 PSIG delivery pressure



Two Stage Regulators

- Precise delivery pressure
- Low flow rates
- Use from 0 to 200 PSIG delivery pressure

*** Regulators only reduce pressure. They are not pressure limiting devices.**

HS-5030-37

Relief Devices

Use a relief device if source MAWP is greater than system MAWP.

Cautions:

- Maximum setting is the component MAWP (ASME code)
- Sufficient flow capacity
- Safe discharge
- No valve between relief and protected component(s)
- Do not reset unless authorized (every (3) three years)



HS-5030-38

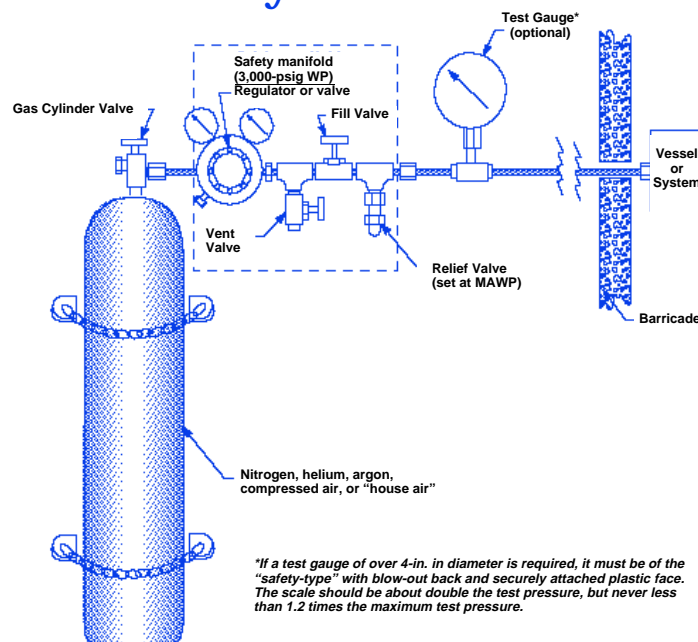
Pressure Gauges



- Graduated to about 2 times the MAWP, **NEVER** less than 1.2 x MAWP.
- Gauge material compatible with system fluid.
- Safety type, if high-hazard.
- Protect against surges, as required.
- **NO** oil with oxygen gauges.
- Provide relief protection.

HS-5030-39

Safety Manifold System



HS-5030-40

Cryogenic Safety

Cryogenic liquids:

Cryogenic liquids are gases that have been transformed into extremely cold refrigerated liquids which are stored at low temperatures below - 100°F. They are normally stored at low pressures in specially constructed, multi-walled, vacuum-insulated containers. For safety considerations, we include liquid carbon-dioxide and liquid ammonia in this classification.

HS-5030-41

Why Cryogenics in a Pressure Safety Program?

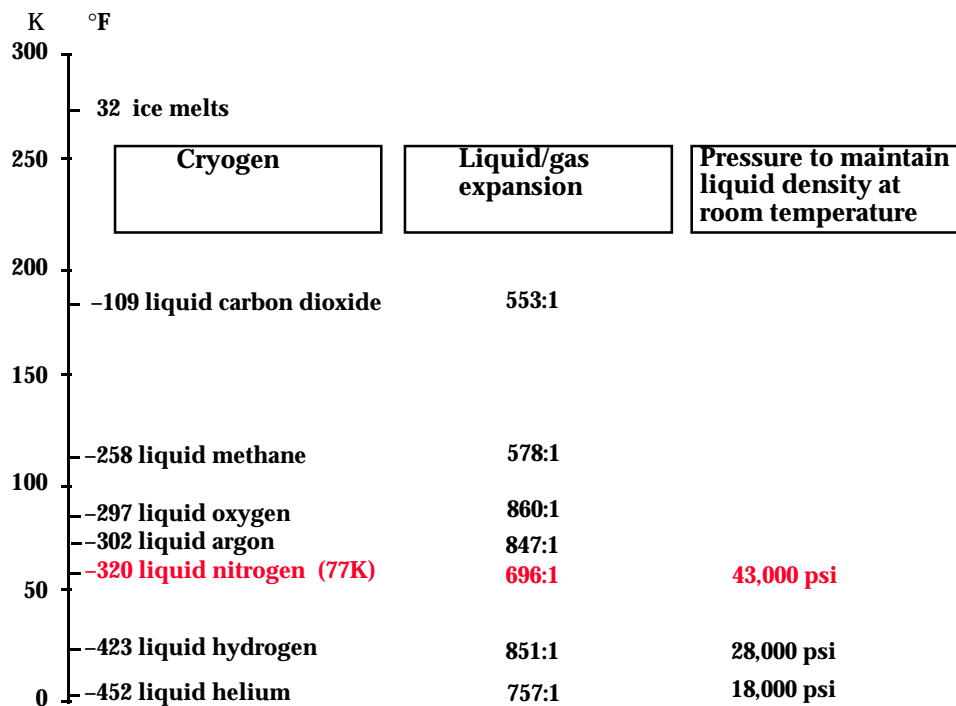
- **A cryogenic system is a pressure system waiting to happen.**
- **Cryogenic systems contain other inherent hazards.**
- **Cryogenic use/application now commonplace.**
- **Knowledge of cryogen types, characteristics, hazards, will heighten safety awareness.**

HS-5030-42

Cryogenic Applications

- Low volume storage and shipping
- Refrigeration - Food transport, etc.
- Cold traps/sorption pumps - vacuum
- Superconductor industry
- Low temperature materials research
- Rocketry - space shuttle, etc.

HS-5030-43



HS-5030-44

Thermal (freezing) hazards

Cryogenics **can** freeze tissue

- Rarely occurs due to gas film (only . . . don't hold it too long!)
- No film protection with CO₂, ammonia

Cold metal parts **will** freeze tissue

- No protective film
- Skin moisture freezes (like tongue on a railroad track)

HS-5030-45

Recommended protection against the freezing hazard

- Wear loose fitting gloves.
- Wear cuffless trousers over boots (no sneakers).
- **Wear eye and face protection (required).**

HS-5030-46

Ice buildup **the most common atmospheric effect of** **cryogenic systems . . . often a hazard**

- **Cold surfaces gather atmospheric moisture.**
- **Critical elements (pressure reliefs, valve packings, etc.) must be maintained above water freezing point.**
- **Most common solution is extended length of poorly conducting material, i.e. . . SST instead of copper.**
- **Critical vent areas should be covered, or pointed down, i.e. . . Dewar necks, pressure reliefs.**

HS-5030-47

At lower temperatures:

- **Most materials get stronger**
 - **304 stainless steel**
 - **K monel**
- **Some materials become brittle**
 - **9% Nickel Steel**
 - **C 1020 Carbon Steel**

HS-5030-48

Don't neglect the asphyxiation hazard

- Cryogens flash to very large gas quantities.
- Cold vapors are heavier than air - displaces it, travels to lowest elevation
- Result is serious oxygen-lean environment
- Remedies
 - Good ventilation
 - Avoid low places, confined spaces, air intakes
 - Oxygen monitors as required

HS-5030-49

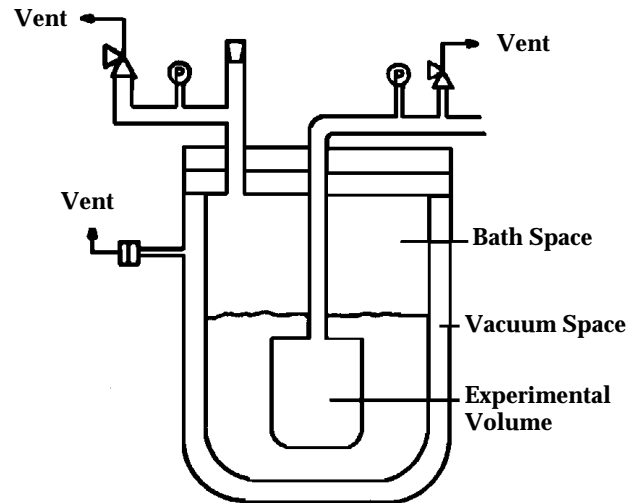
Most frequent cryogenic injury is back strain / sprain

Some solutions

- Local Dewar fill stations
 - minimize need to move cryogen.
- Automatic fill stations
 - moving of cryogens not required.
- Carts, dollies, trucks
 - cryogens easier to move.

HS-5030-50

Greatest Hazard . . . Pressure Build-Up



Each space in contact with the cold must have a pressure relief device.

HS-5030-51

Oxyacetylene Safety

Flash arrestors and check valves

Eleven Commandments of Safety for Fuel Gas and Oxygen

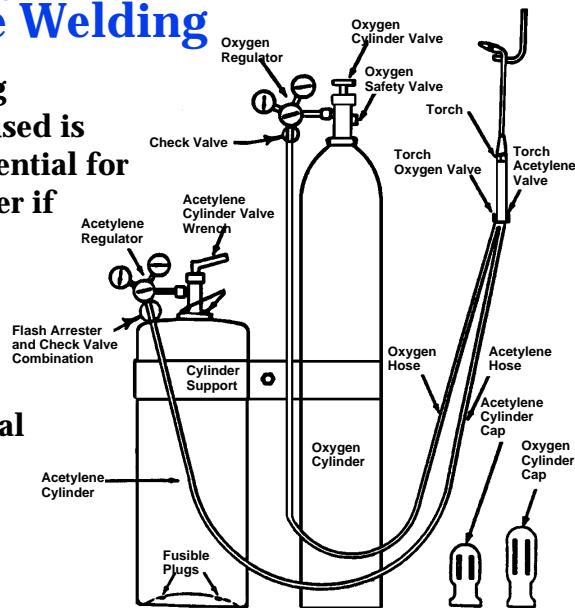
Safety awareness

HS-5030-52

Review of Safety in Oxyacetylene Welding

Oxyacetylene welding equipment properly used is safe, but it has the potential for great destructive power if carelessly used.

Therefore, it is important that the operator be familiar with all of the potential dangers.



HS-5030-53

Eleven Commandments of Safety for Fuel Gas and Oxygen

1. Blow out manifold or cylinder valves before attaching hoses or regulators.
2. Release the regulator adjusting screw before opening the manifold or cylinder valve.
3. **Don't** stand in front of the regulator when opening the valve.
4. Open the valve **slowly**.
5. Don't use fuel gas from cylinders at pressure settings over 15 psi.
6. Purge your fuel-gas and oxygen lines.
7. **Always** light the fuel gas before opening the oxygen line.
8. **Never** use oil or grease around fuel-gas/oxygen equipment.
9. **Never** use oxygen as a substitute for compressed air.
10. Keep heat, flames, and sparks away from hoses, regulators, tanks, and combustibles.
11. Make sure all hose, cylinder, and regulator attachments are tight and not leaking.

HS-5030-54

APPENDIX A

PRESSURE SAFETY CODES AND STANDARDS

- **Federal OSHA**
 - 29 CFR 1910, "Labor"**
 - 29 CFR 1926, "Construction Standard"**
 - 49 CFR 173, "Transportation"**
- **National Fire Protection Association (NFPA)**
- **American National Standards Institute (ANSI)**
- **United States Department of Transportation (DOT)**
- **American Society of Mechanical Engineering (ASME)**
- **Compressed Gas Association (CGA)**
- **Local / State Codes**

- **Federal OSHA 29 CFR 1910, "Labor," (July 1, 1991 edition)**

Definitions, 1910.251

General Requirements, 1910.252

Compressed Gas Cylinders/Gases (General Requirements)

- **Inspection, 1910.101(a)**
- **Approval, 1910.252(b)(1)**
- **Storage/Handling, 1910.101(b)**
- **Safety Relief Valves, 1910.101(c), 1910.110**
- **Public Protection, 1910.101(c), 1910.252(a)(8)**
- **Standards Source, 1910.115**

Air Receivers/Compressed Air Equipment, 1910.169

Acetylene, 1910.102 (a-c)

Hydrogen, 1910.103

- **Gaseous Hydrogen Systems, 1910.103(b)(1)(2)**
- **Liquid Hydrogen System, 1910.103(c) (1-3)**

Liquid Petroleum Gas (LPG) Storage and Handling, 1910.110

Bulk Oxygen Systems, 1910.104

- **Gaseous Oxygen Systems, 1910.104(b)(4)(iii)**
- **Liquid Oxygen Systems, 1910.104(b)(4)(ii)**

Flammable and Combustible Liquids, 1910.106

- **Vessels 1910.106(b)(1)(v)**
- **Piping/Valves/Fittings, 1910.106(c)**

Oxygen-Fuel Gas Welding and Cutting, 1910.253

- **General Requirements, 1910.253(a)(1)**
 - Maximum Pressure, 1910.253(a)(2)
- **Cylinders and Containers, 1910.253(b)**
 - Approval and Marking, 1910.253(b)(1) (i-iv)
 - Storage, 1910.253(b)(2) (i-iv)
 - Operating Procedures, 1910.253(b)(5)(i)(ii)
- **Manifolding of Cylinders, 1910.253(c)(1)(2)(3)**
- **Service Piping System, 1910.253(d)**
 - Materials and Design, 1910.253(d)(1)
- **Protective Equipment, Hoses and Regulators, 1910.253(e)**
 - Backflow and Flashback Protection, 1910.253(e)(3)
 - Regulators, 1910.253(e)(6)(i-iv)
- **Federal OSHA 29 CFR 1926, "Construction Standard"**
 - LPG Gas, 1926.153
 - Welding, 1926.350

Federal OSHA 49 CFR 173, "Transportation," (October 1, 1990 edition)

Definitions, 173.300

Compressed Gas, 173.300(a)

- **Flammable Compressed Gas, 173.300(b)(1-4)**
- **Cryogenic Liquid, 173.300(f)**

Qualification, Maintenance and Use of Cylinders, 173.34

- **General Qualifications, 173.34(a)**
 - Charging/Filling, 173.34(a)(1)
- **Pressure Relief Devices, 173.34(d)(1-7)**
- **Periodic, Retesting, Re-inspection and Marking of Cylinders, 173.34(e)**

General Requirements for Shipment of Compressed Gases in Cylinders, 173.301

- **Retest of Container, 173.301(c)**

Charging of Cylinders with non-liquidified Compressed Gases, 173.302

- **Filling limits, 173.302(b)(c)(1-5)**
- **Fluorine, 173.302(d)**

Charging of Cylinders with Compressed Gas in Solution (acetylene), 173.303

- Cylinder, Filler and Solvent Requirements, 173.303(a)(1)(2)
- Filling Limits, 173.303(b)

Charging of Cylinders with Liquefied Compressed Gas, 173.304

- Filling Densities, 173.304(a)(2)
- Filling Limits, 173.304(b)
- Verification of Content in Cylinder, 173.304(c)(1)(2)

Charging of Cylinders with a Mixture of Compressed Gas and Other Material, 173.305

General Packaging Requirements for Poison A Materials, 173.327

Specifications for Cylinders, 178.36 - 178.68

- Hydrostatic Test, 178.36-14
- Specification 3AL, Aluminum Cylinders, 178.46

APPENDIX B - CGA Cylinder Connection Listing

Gas	Valve Outlet & Conn. No.	Gas	CGA Valve Outlet & Conn. No.
Acetylene	510	2-2 Dimethylpropane	510
Air, Breathing	346	Ethane	350*
Air, Industrial	590*	Ethyl Chloride	300*
Allene	510**	Ethylene	350*
Ammonia, Anhydrous	705†	Ethylene Oxide	510†
Ammonia, Electronic	660/720	Fluorine	679
Argon	580*/718	Germane	350/632
Argon-3500 psig	680***	Halocarbon 12 (Dichloro- difluoromethane)	660*/716
Argon-6000 psig	677	Halocarbon 13 (Chlorotri- fluoromethane)	660/716
Arsine	350/632	Halocarbon 13B1 (Bromotri- fluoromethane)	660
Boron Trichloride	660†/634	Halocarbon 14 (Tetra- fluoromethane)	320*/716
Boron Trifluoride	330†/642	Halocarbon 22 (Chlorodi- fluoromethane)	660*
1-3 Butadiene	510*	Halocarbon 23 (fluoroform)	660/716
Butane	510*	Halocarbon 114 (2,2 Dichloro- tetrafluoroethane)	660*
Butenes	510*	Halocarbon 115 (Chloro- pentafluoroethane)	660*
Carbon Dioxide	320*/716	Halocarbon 116 (Hexa- fluoroethane)	660
Carbon Monoxide	350*/724	Halocarbon 142B (Chloro- 1,1-Difluoroethane)	510
Carbonyl Fluoride	660		
Carbonyl Sulfide	330†		
Chlorine	660**		
Cyanogen	660		
Cyanogen Chloride	660		
Cyclopropane	510*		
Deuterium	350*		
Dichlorosilane	678/636		
Dimethylamine	705†		
Dimethyl Ether	510*		

* Lecture bottles use CGA No. 710

** Lecture bottles use CGA No. 110

*** For information on CGA 680 and 695 connections contact your nearest Matheson office

† Lecture bottles use CGA No. 180

CGA Cylinder Connection Listing (continued)

Gas	CGA Valve Outlet & Conn. No.	Gas	CGA Valve Outlet & Conn. No.
Halocarbon 1113 (Chloro- trifluoroethane)	510	Nitrogen-6000 psig	677
Helium-3500 psig	680***	Nitrogen Dioxide	660
Helium	580*/718	Nitrogen Trioxide	660
Hexafluoropropylene	660*	Nitrous Oxide	326*
Hydrogen	350*/724	Octofluorocyclobutane	660*
Hydrogen-3500 psig	695*	Oxygen	540*/714
Hydrogen Bromide	330†/634	Oxygen Mixtures Over 23%	296
Hydrogen Chloride	330**/634	Perfluoropropane	660*/716
Hydrogen Fluoride	660†/638	Phosgene	660
Hydrogen Iodide	330†	Phosphine	350/632
Hydrogen Selenide	350	Phosphorous Penta- fluoride	660†
Hydrogen Sulfide	330**/722	Propane	510*
Isobutane	510*	Propylene	510*
Isobutylene	510*	Silane (High Pressure)	350/632
Krypton	580/718	Silicon Tetrafluoride	330†/642
"Manufactured Gas B"	350	Sulfur Dioxide	660**
Methane	350*	Sulfur Hexafluoride	590*/716
Methyl Bromide	330	Sulfur Tetrafluoride	330†
3-Methyl Butene-1	510	Trimethylamine	705†
Methyl Chloride	660*	Vinyl Bromide	510
Methyl Fluoride	350	Vinyl Methyl Ether	510
Methyl Mercaptan	330**	Xenon	580**/718
Monomethylene	705†		
Neon	580*/718		
Nitric Oxide	660/712		
Nitrogen	580*/718		
Nitrogen-3500 psig	680***		

* Lecture bottles use CGA No. 710

** Lecture bottles use CGA No. 110

*** For information on CGA 680 and 695 connections contact your nearest Matheson office

† Lecture bottles use CGA No. 180

CGA Publications and Audio-Visuals*

Pamphlet No.	Title	Pamphlet No.	Title
AV-1	Safe Handling and Storage of Compressed Gases	C-10	Recommended Procedures for Changes of Gas Service for Compressed Gas Cylinders
AV-3	Filling Industrial and Medical Nonflammable Compressed Gas Cylinders	C-11	Recommended Practices for Inspection of Compressed Gas Cylinders at Time of Manufacture
AV-4	Characteristics and Safe Handling of Medical Gases	C-12	Qualification Procedure for Acetylene Cylinder Design
AV-5	Safe Handling of Liquefied Nitrogen and Argon	C-13	Guidelines for Periodic Visual Inspection and Requali- fication of Acetylene Cylinders
AV-7	Characteristics and Safe Handling of Carbon Dioxide	C-14	Procedures for Testing of DOT Cylinder/Safety Relief Device Systems
AV-8	Characteristics and Safe Handling of Cryogenic Liquid and Gaseous Oxygen	C-15	Procedures for Cylinder Design Proof and Service Per- formance Tests
AV-9	Handling Acetylene Cylinders in Fire Situations	C-16	CGA Registration Program for Cylinder Owner Symbols
		C-16.1	CGA Cylinder Owner's Registration Symbols and Company Names
C-1	Methods for Hydrostatic Testing of Compressed Gas Cylinders	CGA-341	Standard for Insulated Cargo Tank Specification for Cryo- genic Liquids
C-2	Recommendations for the Disposal of Unserviceable Compressed Gas Containers with Known Contents	E-1	Standard Connection for Regulator Outlets, Torches and Fitted Hose for Welding and Cutting Equipment
C-3	Standards for Welding on Thin Walled Steel Cylinders	E-2	Hose Line Check Valve Standards for Welding and Cutting
C-4	American National Standard Method of Making Portable Compressed Gas Containers to Identify the Material Contained	E-3	Pipeline Regulator Inlet Connection Standards
C-5	Cylinder Service Life--Seamless Steel Compressed Gas Cylinders	E-4	Standard for Gas Regulators for Welding and Cutting
C-6	Standards for Visual Inspection of Steel Compressed Gas Cylinders	E-5	Torch Standard for Welding and Cutting
C-6.1	Standards for Visual Inspection of Aluminum Compressed Gas Cylinders	E-6	Standard for Hydraulic Type Pipe Line Protective Devices
C-6.2	Guidelines for Visual Inspection and Requalification of Fiber Reinforced High Pressure Cylinders	E-7	American National Standard for Flowmeters, Pressure Reducing Regulators, Regulator/Flowmeter and Regulator/ Flowgauge Combination for the Administration of Medical Gases
C-6.3	Guidelines for Visual Inspection and Requalification of Low Pressure Aluminum Compressed Gas Cylinders	E-9	Standard for Medium Pressure (3000 PSIG) Flexible P.T.F.E.- Lined Pigtail for Compressed Gas Service
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